

figure. All of the specimens from Colombia are stained by oxides of iron and manganese on their exterior surfaces and also stained on the interior, but the discoloration here is confined largely to the regions adjacent to the vascular canals. The outer, more dense layer of bone is generally light brown in color, whereas the central, more porous part, is pale yellow or white with an occasional growth of black dendritic wad. In a few of the broken specimens the central bone material has largely disappeared and such individuals present much the appearance of geodes or concretions. There are no surface markings on the exterior other than irregular ridges and grooves and the pits formed by the entrance of the vascular canals.

Most of the Colombian ossicles are larger than those of *Glossotherium* and apparently more irregular in outline and surface markings. Some of them are distinctly elongate and in this characteristic they are somewhat similar to the elongate, oriented elements that Woodward describes from the fragment of skin ascribed to the flank of *Glossotherium*. Several of the smaller specimens approach somewhat the degree of regularity exhibited by the quadrilateral forms from *Mylodon harlani* as figured by Sinclair (Fig. 1, *b, c, d*) and Stock (Plate 21). The majority compare rather closely in size and irregularity with the more unsymmetrical individuals figured by Stock. They appear to be more like the ossicles described from *Mylodon* and are referred provisionally to *Mylodon robustus* Owen var. *tarijensis* Ameghino.

PALEONTOLOGY.—A new *Pennsylvanian trilobite from Missouri*.¹

JAMES S. WILLIAMS, U. S. Geological Survey. (Communicated by GEORGE H. GIRTY.)

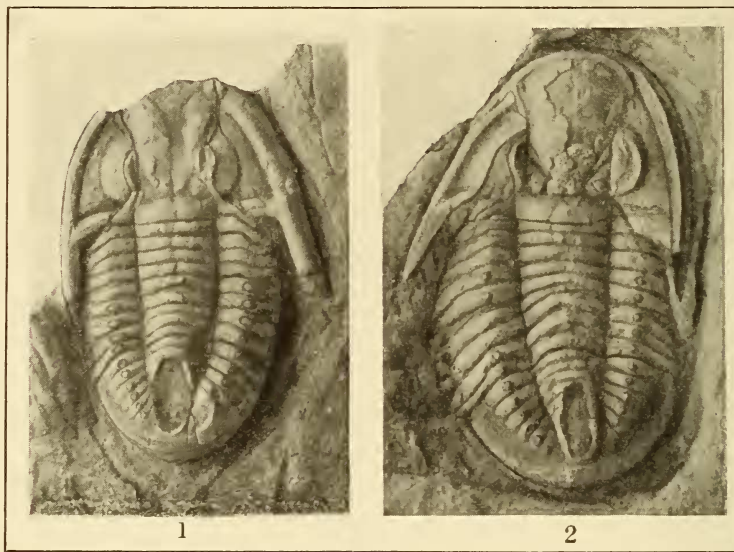
Complete dorsal shields of trilobites are rarely found in Pennsylvanian rocks, and their discovery is therefore always fortunate. If they represent new species, their description often prevents the creation of synonyms based on isolated parts. If they represent species previously known from incomplete specimens, the description may reveal the identity of two species or it may show that isolated pygidia and cephalia placed in a single species are not truly conspecific.

The new species here described is based on two cotypes each of which has the cephalon, thorax, and pygidium in articulation. The typical specimens were collected by Mr. W. S. Olson and myself from the lower part of the Cherokee (lower Pennsylvanian) shale near Columbia, Missouri, in 1929, while studying the stratigraphy of the

¹ Published by permission of the Director of the U. S. Geological Survey. Received May 25, 1933.

Pennsylvanian rocks of the central Missouri fire-clay district. Although for many years trilobites have been known to occur in the Cherokee formation, this species is the first to be described from it from Missouri.

In describing this trilobite I have departed somewhat from the traditional practice and have given in advance of the detailed description and arranged under definite and mutually exclusive headings sufficient information for a working knowledge of the species. Although most paleontologists include this information in their de-



Figs. 1 and 2.—*Griffithides olsoni* Williams, n. sp. $\times 4$. Fig. 1, cotype 5183; Fig. 2, cotype 5184.

scriptions, it is not always distinctly separated from the detailed description and is therefore sometimes difficult to find. If the specific characters were always summarized under definite headings, much unnecessary work by subsequent investigators would be avoided. The arrangement is by no means a new one. It has for a long time been in common use by some students of fossil vertebrates and some paleontologists have used it in describing genera and species of fossil invertebrates. It has not, however, been used to any extent by students of fossil invertebrates. A more extensive use of this arrangement would not only save time but would also be a step toward greater precision in fossil descriptions.

The photographs shown in the figures were made by N. W. Shupe and retouched by Miss Frances Wieser.

Griffithides olsoni Williams, n. sp.

Specific diagnosis: This species is characterized by the following combination of characters: small size, length less than twice the width, granulose surface, granules on glabella larger than those on rest of dorsal shield, most of granules on axial segments of thorax and pygidium irregularly arranged, small and inconspicuous basal lobes on glabella, no prominent mesial lobe between basal lobes, no transverse glabellar furrows except those that delimit basal lobes, nine segments in thorax, six complete pleural segments on pygidium.

Comparisons: In the number of segments on the pleural lobe of the pygidium, in its rather small size, and in several other characters, *G. olsoni* resembles *G. ornatus* Vodges, 1895, from the Pennsylvanian of Arkansas, *G. parvulus* Girty, 1911, from the Wewoka and Boggy formations of Oklahoma, and *G. scitulus* Meek and Worthen, 1865, a widespread Pennsylvanian species. Its closest resemblance is perhaps to *G. scitulus* and if the type of that species were available for study, my specimen might be found to be conspecific with it. I have, however, been unable to locate the type of *G. scitulus* and as a consequence must rely on the original and subsequent descriptions and on fragmentary and insecurely identified specimens in the United States Geological Survey collections from the type locality for data about it. Published figures do not show critical parts of the type in detail. Although *G. scitulus* has been described from several localities by different authors, it seems that Meek and Worthen were the only authors who examined the type.

G. olsoni differs from Meek and Worthen's original description of *G. scitulus* in the following ways: There are no indications of transverse glabellar furrows anterior to those that delimit the basal lobes on *G. olsoni*; *G. olsoni* has small basal lobes which, although the transverse furrows are not visible, appear to have raised portions that are more nearly suboval than subtriangular, and *G. scitulus* is said to have large subtriangular basal lobes; *G. olsoni* has no prominent mesial lobe between the basal lobes of the glabella. Another difference between *G. olsoni* and some forms described as *G. scitulus* is the absence of a single row of prominent nodes on each segment of the axis of the thorax and pygidium of *G. olsoni*. Although granules on some of the axial segments of *G. olsoni* appear to be so arranged, they are much smaller than the nodes attributed to *G. scitulus*. On some of the anterior segments of the thorax of *G. olsoni* granules are numerous but are not regularly arranged. They are only slightly smaller than the granules that appear to be regularly arranged and undoubtedly are morphologically the same. Their irregular arrangement suggests that the seeming regularity of some of the granules is due to the failure of others to be preserved. Meek and Worthen's descriptions of *G. scitulus* do not mention regularly arranged nodes and their possible presence on *G. scitulus* is based on descriptions by subsequent authors and on a row of nodes on the occipital segment of a fragmentary cephalon in the United States Geological Survey collection from the type locality of *G. scitulus*. Most of the differences cited are of degree rather than of kind but it seems better to place my specimens in a new species rather than to include them in one with whose description they do not agree, even though it seems likely that an examination of the type or of good specimens from the type locality may prove that description slightly misleading. If *G. scitulus* does have definite transverse glabellar furrows aside from those that delimit the basal lobes, as its description indicates, it does not conform fully to the description of *Griffithides*.

G. olsoni does not have the posterior part of its glabella divided into three knoblike nodes as does *G. parvulus*; it has no distinct indications of transverse glabellar furrows anterior to those that delimit the basal lobes as does this species; its facial sutures do not come nearly together in front; it does not, as before discussed, have single transverse rows of small but distinct nodes across the posterior part of the occipital segment and across each axial segment of the thorax and of the pygidium; and its length is less than twice its width. The length of *G. parvulus* is about two and one-half times its width.

From *G. ornatus*, *G. olsoni* differs because of its inconspicuous basal lobes, its smaller number of complete pleural segments on the pygidium, and its lack of distinct rows of rather large nodes on each axial segment of the thorax and pygidium. *G. ornatus* has basal lobes said to be prominent, seven complete pleural segments on the pygidium, and rather pronounced nodes arranged in a single row across each axial segment but grouped so as to form three double rows of nodes extending from the anterior of the thorax to the posterior of the axial lobe of the pygidium.

Walter² has suggested that the three species compared in the foregoing paragraphs with *G. olsoni* may belong to one species, *G. scitulus*. Of the types of these species, I have seen only that of *G. parvulus*, and can not test this suggestion adequately. It is undoubtedly true that changes in specific designations and perhaps in some of the kinds of characters used for specific distinctions will come when the trilobites of the Pennsylvanian are studied with the types and large collections assembled for careful scrutiny; and some species may then be found to be merely molts of other species. It is not desirable, however, to delay the description of newly collected material until such revisional studies are completed; and until new information based on typical material is available, it seems the most conservative course to recognize species as they are now generally recognized and use specific characters as they have been used.

Another species that is closely related to *G. olsoni* is *G. morrowensis* Mather 1915 from the Morrow group of Arkansas and Oklahoma. Mather's species is, however, a larger form. It has more pleural and probably more axial segments on its pygidium than does *G. olsoni*, and it also has a prominent median lobe between the two basal lobes of the glabella. Mather's figure suggests that it also has much narrower free cheeks.

Significance of name: This species is named for Mr. W. S. Olson, formerly of Columbia, Missouri, who collected one of the cotypes.

Type material: The cotypes are two in number. Both of them have the cephalon, thorax, and pygidium in articulation. Both also have part of the axis of the pygidium incomplete. The anterior part of the cephalon and part of the dorsal surface of the glabella has been removed by erosion from the smaller cotype. It is number 5183 of the type collections of Carboniferous invertebrate fossils of the United States Geological Survey; the larger cotype is number 5184 of the same collection.

Description: Carapace small, elliptical, slightly more than one and one-half times as long as wide; the cephalon, more than one-third as long as entire carapace, thorax shorter than cephalon, and pygidium about equal to or slightly shorter than thorax.

Cephalon semielliptical, evenly rounded in front on cotype 5184, incomplete in front of other cotype; surrounded by a longitudinally striated, narrow border or marginal rim which is distinctly above the free cheeks but is

² WALTER, OTTO T. Iowa Geol. Survey 31: 334. 1926(?)

not as high as the anterior part of the glabella; the border appears to be turned up in front of the glabella on cotype 5184 but neither cotype is complete enough to enable one to determine certainly that it is; the border extends beyond the genal angles and forms spines which reach to the fifth or sixth thoracic segment and are about one-half as long as the cephalon. The spines gradually become narrower from the genal angles until within about a half-millimeter of their ends where they rapidly narrow to a sharp point; on cotype 5183 the raised border extends across the posterior margin of the cephalon from the genal angles to the facial suture but it is narrower there than on the sides; on cotype 5184, the border on the posterior of the cephalon is visible but it is lower and less distinct. *Facial sutures* distinct posterior to the eyes on both cotypes and on cotype 5183 almost to the marginal rim or border, but their course across the border can not be traced because the border is broken or partly broken at every place that the facial sutures intersect it. The facial sutures cut the posterior margin of the cephalon at a point about midway between the longitudinal dorsal furrows and the genal angles; they extend obliquely forward from this point almost to the glabella but before reaching the glabella curve away from it around the palpebral lobes; from the anterior of the palpebral lobes they go at angles of about 20° with the longitudinal axis of the carapace toward the anterior lateral margins of the cephalon. *Free cheeks* depressed, as wide as the glabella at the mid-length of the eyes, almost flat except at border and around eyes. Eyes large, extending from slightly in front of the occipital furrow nearly half the distance to anterior margin of cephalon; semilunate; elevated as high above general level of free cheek as marginal rim, but not as high as glabella; granules distinctly visible only on cotype 5183. *Cranidium* with a large glabella and narrow fixed cheeks. Palpebral lobes opposite posterior two-fifths of glabella; separated from it by a distinct furrow. Glabella pyriform, prominent, occupying about one-third the width of the posterior of the cephalon and probably extending to the anterior margin; it widens about one-third its posterior width at the anterior margin and is much more highly elevated anteriorly; its front is nearly perpendicular. The glabella is not so prominent on cotype 5183 but it has apparently been worn off by erosion of this specimen. Basal lobes inconspicuous and indistinct; evidently worn down on cotype 5183; probably almost entirely preserved on cotype 5184; as preserved, the basal lobes are more nearly suboval than subtriangular but the furrows separating the basal lobes from the rest of the glabella are not visible and they may be so slightly curving that they enclose subtriangular areas, parts of which are below the suboval areas, but this can not be ascertained and it appears most probable that the suboval raised areas constitute the basal lobes. Each lobe occupies about one-fourth the width of the posterior of the glabella. No other transverse glabellar furrows, except the occipital furrow, or indications of furrows are visible on cotype 5184. On the other cotype, a slight linear depression passes across the glabella in front of the basal lobes and if it were interpreted as a transverse glabellar furrow it would separate a median posterior lobe on the glabella from the anterior of the glabella. The absence of a transverse furrow on this part of cotype 5184, which is fairly well preserved, and the depth of the furrow and the presence of other furrows caused by erosion on the glabella of cotype 5183 strongly suggest that this is not a true glabellar furrow but is simply an erosional feature. *Occipital segment* about as wide as the two adjoining thoracic segments; separated from the rest of glabella by deep, wide furrow; surface of segment slopes upward from occipital furrow to posterior one-fourth of oc-

cipital segment where there is a narrow crest; a very short steep downward slope back of the crest continues to the posterior margin; a distinct node is visible in the center of the occipital segment on one cotype and is indicated on the other. *Surface* of glabella appears from fragments of the test preserved on cotype 5184 to have been rather coarsely pustulose; the remainder of the cephalon is less coarsely pustulose and pustules are not visible on many parts of it.

Thorax over one and one-half times as wide as long; slightly wider at anterior margin than at posterior margin; distinctly trilobate. *Axis of thorax* broad and moderately but not highly arched; more than twice the width of that portion of the pleural lobe above the abrupt down bending or fulcrum and equal or nearly equal to the entire width of pleural lobe. *Pleura* abruptly bent downward at about one-third their length from the longitudinal dorsal furrow; proximal portion of pleura forming a right or slightly obtuse angle with distal portion at fulcrum; on many of the pleural segments the angle formed at the fulcrum is extended into a distinct node. Each pleural segment is subdivided by a fine striation which extends below the fulcrum from near the longitudinal dorsal furrow and divides the segment into an anterior part which is about one-third and a posterior part which is about two-thirds as wide as the entire segment. Thorax of nine segments; distal ends of pleural segments not observed. *Surface of thorax* finely granulated but, aside from the nodes at the fulcra of the pleural segments, no granules large enough to be called nodes are present. On two or three posterior segments of the axis only a few granules are preserved and these have a linear arrangement which might give the impression that there is a single transverse row of granules across the segments of the axis of the thorax. Examination of anterior segments that are well preserved shows that they have many granules which are irregularly arranged and this observation suggests that the seeming arrangement of the granules in single transverse rows across the posterior axial segments may be only a result of the failure of many other granules to be preserved. The irregular arrangement of most of the granules and their small size prevents their being interpreted as nodes similar to those which are regularly arranged on many species of *Griffithides*.

Pygidium subsemielliptical, nearly twice as wide as long, surrounded by a smooth, uniform, slightly convex border which varies in convexity on different parts of the pygidium but does not vary much in width. *Axis* partly broken on both cotypes; from parts of axis preserved one would judge that it was prominent and highly arched but probably had a flattened area on top about equal to half its width. Axis extending from anterior of pygidium to marginal rim, about one-sixth length of pygidium from posterior of pygidium; gradually tapering, nearly twice as wide at anterior end as at posterior. Two anterior segments of axial lobe preserved on cotype 5183 and three anterior segments preserved on cotype 5184. A few fine irregularly arranged granules ornament the segments of the axis but no nodes are visible. Each lateral or *pleural lobe* bent nearly at right angles to the general plane of the carapace at about one-third its width from longitudinal dorsal furrow at front of pygidium; at the posterior part of pygidium the bend is about one-half the width of pleural lobe from the longitudinal dorsal furrow. A row of nodes, one at the fulcrum of each segment, ornaments each pleural lobe. Six complete and one incomplete pleural segments can be distinguished on the pygidium of cotype 5184 and on one side of the pygidium of cotype 5183; the other side of the latter cotype is not completely preserved. Pleural segments distinct; separated by distinct intersegmental furrows; not subdivided as

those of the pleura of the thorax by transverse striae; terminating in the smooth border that surrounds the pygidium. With the exception of the nodes at the fulera there are no recognizable nodes on the pleural segments but a few granules on the pleural segments suggest that they were granulose.

Dimensions: Measurements of the two cotypes, 5183 and 5184, are respectively as follows:

Length of carapace 13 mm. and 14.4 mm.; greatest width of carapace, measured at posterior of genal spines, 8.3 mm. and 9 mm.; length of cephalon, including occipital segment, 5 mm. and 5.6 mm.; length of thorax 3.6 mm. and 4.3 mm.; length of pygidium 3.6 mm. and 4.2 mm.; greatest width of cephalon, 0.6 mm. and 0.6 mm.; approximate width of genal spines at genal angle, 0.65 mm. and 0.65 mm.; width of glabella at posterior of cephalon 2.6 mm. and 2.7 mm.; width of glabella at anterior margin, 3.2 mm. and 3.6 mm.; probable greatest diameter of basal lobes (measurements uncertain), 0.6 mm. and 0.6 mm.; width of occipital segment 0.7 mm. and 0.8 mm.; greatest width of thorax 6.9 mm. and 7.8 mm.; width of axis of thorax at anterior of thorax, 2.6 mm. and 3 mm.; width of portion of pleural segment above fulcrum, 0.9 mm. and 1.1 mm.; approximate width of portion of pleural segments below fulcrum 1.4 mm. and 2.1 mm.; width of pygidium, 5.4 mm. and 6.8 mm.; length of pygidium 3.8 mm. and 4.3 mm.; approximate width of border around pygidium, 0.65 mm. and 0.72 mm.; width of axis of pygidium at anterior of pygidium, 2 mm. and 2 mm.; approximate width of posterior end of axis of pygidium 1.1 mm. and 1.2 mm.; approximate length of axis of pygidium, 3.2 mm. and 3.6 mm.

Remarks: This species has relatively larger eyes than is characteristic of the genus. Although it has small irregularly arranged granules, it is also without the transverse rows of coarse pustules or nodes seen on many species of the genus. Its glabella is, however, typical of forms commonly referred to *Griffithides*.

Horizon and locality: Cherokee shale, probably about bed 15 of Broadhead's section³ and horizon of bed 15 of Hinds and Greene's section,⁴ nine feet above Tebo coal horizon, second limestone (about 30 feet) stratigraphically above Pennsylvanian-Mississippian contact: Hinkson Creek, east side of creek, about four feet above ordinary water-level, about one-eighth mile north of bridge on road from Columbia, Missouri, to Edwards brick plant; west of and in creek below brick plant. The locality is about 1 mile east of Columbia, Missouri, and about in the NW. $\frac{1}{4}$, sec. 8, T. 48 N., R. 12 W. The beds dip to the southwest at this exposure and basal Pennsylvanian fire-clay is exposed 30 to 40 feet north of and more or less continuous with the exposure.

³ BROADHEAD, G. C. Missouri Geol. Survey 12 (pt. 3): 385. 1898.

⁴ HINDS, HENRY and GREENE, F. C. Missouri Bur. Geology and Mines 13 (2nd ser.): 57. 1915.

PHYTOPATHOLOGY.—*The dark ages in Plant Pathology in America: 1830-1870.*¹ NEIL E. STEVENS, Bureau of Plant Industry. (Communicated by C. L. SHEAR.)

Many of the important activities in the history of plant pathology in the United States were initiated during the decade 1871 to 1880.

¹ Received February 16, 1933.